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which are now in the United States National Museum, but these did not come under Mr. Merrill's observation. It must be noted in this connection that Mr. Merrill's material was proportionally very limited in comparison to the vast extent, variation and stratigraphic zones of the flints in Texas, and the only cause for regret is that he did not have a more extensive collection for study.

Regarding the depth of the water in which the flints were formed, only a very general conclusion was reached, viz., it was beyond the continental shelf, but not in the deepest sea.

The plate accompanying the paper is made up of thirty-six figures drawn by J. H. Emerton. The size of the objects figured was very carefully determined by micrometer measurements.

The author should be complimented on the painstaking manner in which he has done this important work, and it stands as the first careful microscopic research into any part of the great series of chalky limestone sediments in the two great series of the Cretaceous in Texas.

T. WAYLAND VAUGHAN.

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*Thirteenth Annual Report of the State Geologist (New York) for the year 1893.* JAMES HALL, State Geologist.

This report consists of two volumes, the first devoted to geology and the second to palæontology. The papers published in Volume I. may be divided into two sections: first, those relating to the Livonia salt shaft, and second, papers on geologic work being done in connection with the preparation of a new geologic map of the state.

In November, 1890 the Livonia Salt Company began the sinking of a shaft of 12 x 22 feet, 1432 feet in depth, at Livonia, Livingston county, New York. Detailed records were not preserved for the first 380 feet, but from that depth to the bottom, Mr. D. D. Luther, in the employ of the state geologist, kept a careful record of the stratigraphy and collected great numbers of fossils, accurately recording their horizons. The strata penetrated were as follows: Drift (64 ft.), Portage (55 ft.), Genesee (161 ft.), Hamilton (517 ft.), Marcellus (69 ft.), Corniferous (132½ ft.), Onondaga (2½ ft.), Oriskany (5 ft.), Lower Helderberg (112 ft.), and Salina (314 ft.). This is probably the most extensive continuous section of stratified rocks that has ever been submitted to such a detailed study, and the papers relating to it

bring out many interesting facts, especially that of Professor Clarke on *The Succession of Fossil Faunas*.

The following papers relating to this shaft, illustrated by numerous maps, charts and plates, are incorporated in the report :

*The Livonia Salt Shaft, its History and Geological Relations, etc.* By James Hall.

*Report on the Geology of the Livonia Salt Shaft.* By D. D. Luther.

*The Succession of the Fossil Faunas in the Section of the Livonia Salt Shaft.* By J. M. Clarke.

*New or Rare Species of Fossils from the Horizons of the Livonia Salt Shaft.* By J. M. Clarke.

The remainder of Volume I. is devoted to the following geological papers :

*Report on the Relations of the Helderberg Limestones and Associated Formations in Eastern New York.* By N. H. Darton.

*Preliminary Report on the Geology of Albany County.* By N. H. Darton.

*Economic Geology of Albany County.* By F. L. Nason.

*Preliminary Report on the Geology of Ulster County.* By N. H. Darton.

*Economic Geology of Ulster County.* By F. L. Nason.

*Geology of the Mohawk Valley in Herkimer, Fulton, Montgomery and Saratoga Counties.* By N. H. Darton.

*Preliminary Report on the Geology of Essex County.* By J. F. Kemp.

*Preliminary Report on the Geology of Clinton County.* By H. P. Cushing.

*Report on a Preliminary Examination of the General and Economic Geology of Four Townships in St. Lawrence and Jefferson Counties.* By C. H. Smyth, Jr.

*Report on the Geology of Cattaraugus and Chautauqua Counties.* By F. A. Randall.

*Report on Field-work in Chenango County.* By J. M. Clarke.

*A List of Publications Relating to the Geology and Palæontology of the State of New York, 1876-1893.* Compiled by J. M. Clarke.

Volume II. of the report contains the following palæontological papers :

*Evolution of the Genera of the Palæozoic Brachiopoda.* (Extract from *Palæontology of New York, Vol. VIII., Part II.*) This is a valuable paper summing up the conclusions to which Professors Hall and

Clarke have arrived during their prolonged study of this important group of fossils.

*Descriptions of New Species Figured in Vol. VIII., Part II.*

*Platyncemic Man in New York.* By W. H. Sherzer.

*A Discussion of the Different Genera of Fenestellidæ.* By G. B. Simpson.

*Glossary and Explanations of Specific Names of Bryozoa and Corals Described in Volume VI. Palæontology of New York and Other Reports.* By G. B. Simpson.

The last paper in the report is, *An Introduction to the Study of the Brachiopoda, Intended as a Handbook for the Use of Students. Part II.* By James Hall, assisted by John M. Clarke. Part I. of this handbook was published in the eleventh annual report of the state geologist. Part II. contains generic descriptions and illustrations of the articulate brachiopoda formerly known as the *Spiriferidæ*, *Terebratulidæ*, *Rhynchonellidæ* and *Pentameridæ*. A new classification has been adopted by the authors, but most unfortunately the genera are not arranged in the body of the work in accordance with the *Table of Classification* given at the end. The grouping of the genera into families is not indicated in the text, and in some cases genera placed in the same family in the *Table of Classification* are widely separated in the text.

As in Part I. so in this second part, the most striking feature of the work is the multiplication of generic terms. This breaking up of large, loosely defined generic groups into smaller, sharply defined groups of species is a convenience to the student, and allows the arrangement of the genera into a more natural classification.

The genus *Spirifer* has been left intact, though divided into six sections of less than subgeneric rank. Part of these at least are fully as much differentiated as some of the subgenera, of *Athyris* for instance, which are recognized. Among the spire bearing forms or *Helicopegmata*, the authors have recognized their genera strictly upon the differentiation of a single structure, the brachidium. This is an important structure of the organism, but its differentiation should not be considered as the only important one. The differences in the organisms represented in the fossils by the fine longitudinal striæ in *Spirifer radiatus*, and the concentric bands of peculiar double-barreled spines in *Spirifer lineatus*, were probably as fundamental as the differences of the brachidium upon which the subgenera of *Athyris* are established. If these sections be not of at least subgeneric rank,

then surely *Ambocelia* is not worthy of separation from *Spirifer* as a distinct genus.

The work as a whole is a valuable acquisition to the literature of palæontology, and will be warmly welcomed by all students of the brachipoda.

S. W.

*Istidens foraminiferer i Danmark og Holsten og deres betydning for studiet af istidens aflejringer* [The foraminifera of the Ice-Age in Denmark and Holsten and their significance in the study of the glacial deposits.] By VICTOR MADSEN, Meddelelser fra Dansk Geologisk Forening, No 2, Copenhagen, 1895. 225 pp.

The first part of this paper gives a review of the classifications by different geologists of the drift deposits of northern Europe, England and Denmark. A new classification is then proposed, mainly based on evidences of climatic changes in the Quaternary Age, as the author interprets them from observations in Denmark. His scheme runs as follows:

- 1). Preglacial sedimentary deposits with a temperate fauna and flora. Weybourn crag, Cromer forest-bed in England.
- 2). Preglacial sedimentary deposits with a boreal or arctic fauna and flora. Ledamyalis-bed, arctic fresh water-bed in England. Yoldia-clay in eastern Prussia. The older Yoldia-clay in Vendsyssel, Denmark (?).
- 3). Morainic deposits from the Norwegian ice-current in Denmark, northwest Germany, Holland, Belgium, and on the east coast of England.
- 4). Interglacial sedimentary deposits with an arctic or boreal fauna and flora. Older Yoldia-clay in Vendsyssel? Yoldia-clay at Esbjerg (Denmark)? etc.
- 5). Interglacial sedimentary deposits with a temperate fauna and flora. Cyprina-clay, etc., in Denmark, Holstein, Rügen and Prussia.
- 6). Interglacial sedimentary deposits with boreal or arctic fauna and flora. Yoldia-clay at Esbjerg.
- 7). Morainic deposits from the older Baltic ice-current in Denmark, Skåne, northern Germany and northern Holland.
- 8). Morainic deposits from an ice-current which moved in a direction from N. E. to S. W. in Holland, Skåne and possibly in Denmark.